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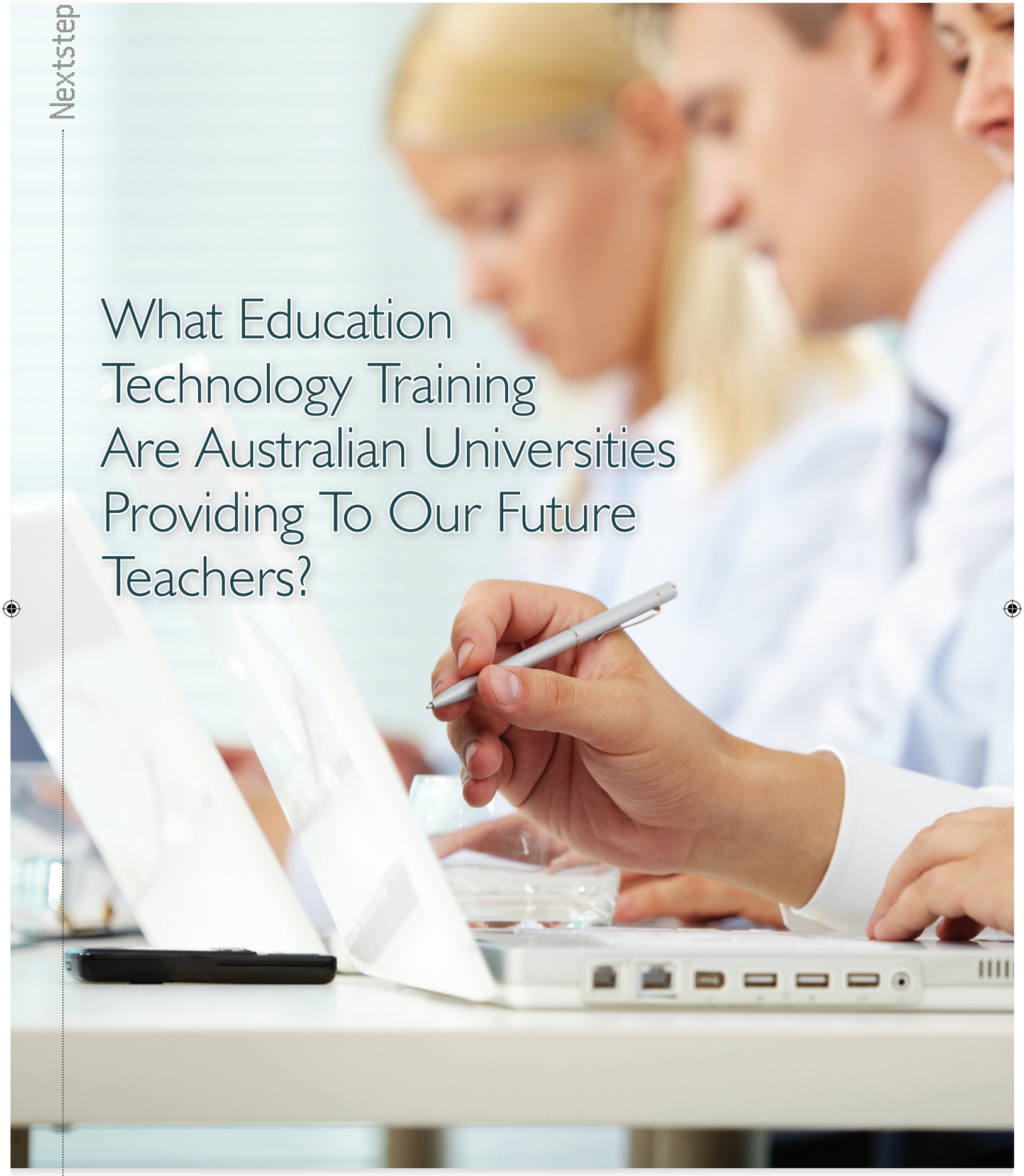

Shelley Kinash And Matthew McLean

Each profession and trade comes with its specialised set of technologies. Engineers are taught to use survey equipment. Chemists learn how to use microscopes. Photographers study apertures and f-stops. Accreditation requirements associated with most careers assure that universities and TAFEs upgrade their programs so as to align them with new technological advances.

For example, in medical school, surgeons now learn laparoscopic techniques so that incisions do not need to be as large and the patient's exposure to anaesthesia not as long. Orthodontists are introduced to software that allows time-lapse imaging and virtual progress so that they can determine exactly where and how long to apply the pressure of braces and bands and show the options to consumers.

The teaching profession is no less impacted by the affordances of emerging technologies. Learning analytics reveal precisely which foundational mathematical concepts a child does not understand, thereby pointing the way for targeted remedial teaching. The computer's capacity for simultaneous word, image and sound enhances comprehension and retention. Making content available through mobile devices means that valuable in-class time can be spent workshopping, experimenting and group problem solving.

Two-dimensional diagrams of difficult biological concepts have been replaced by three-dimensional, moving images that the child can manipulate. For example, the chambers of the heart and their role in the circulatory system make sense when a child can virtually navigate through the body as a single blood cell. As new scientific discoveries are advanced, online book content pushes content updates to learners. Tests are adaptive to students' responses, automatically selecting items that are appropriate to the child's level.

Learning and teaching technology has been proven to catalyse improvements in student motivation and achievement. In addition, children who have a positive and robust experience of technology in schools, make a better transition to learning the technologies of the workforce.

There are necessary conditions, without which, the students do not reap the rewards of technology. The infrastructure must be in place. All across the country, the roll out of the National Broadband Network is taking place. This fibre-optic information superhighway will provide unprecedented internet access and speed to the Australian populace. On completion, schools, households and businesses can connect to cyberspace at speeds which have never been seen before.

In addition to overall infrastructure, the particular access and application needs of schools must be considered and accommodated. Through the National Broadband Network, every school will have access to high-speed broadband. Each classroom will be capable of streaming high-definition video and interactive teaching and learning applications. There is exciting talk of tele-learning, NBN-Enabled Education and a new-age digital classroom.

From the vantage point of technology, a change is coming. The classroom is to have a makeover. We are on the eve of an age where every student has a mobile learning device and every school is wired to a National Broadband Network. The question that we must now consider is, are we ready for it?

The primary condition of technological advancement in learning and teaching is teacher education. Teachers must be trained to use the technology and be able to model competence for the children. To teach students who are ubiquitously using digital tools from early childhood, teachers must, themselves, be technologically capable. To derive the optimal benefits of this new technology, teachers ought to be equipped to synthesise technology and teaching for the benefit of the student. Then, and only then, can our teachers be ready for the digital classroom, as it is now, and as it is growing and developing. Herein, lies the problem.

An analysis was conducted – of 60 technology-related subjects advertised on the websites of 44 pre-service teaching degrees across 22 Schools of Education, throughout Australia's 41 universities. The analysis revealed significant variation in the quantity and quantum of technology training across teaching degrees. Some institutions prescribe as many as four subjects dedicated to technology in a teaching degree, and others mandate not a single one. Most have one or two core technology-related subjects, while many offer additional units as electives.

Prospective teachers in some universities will learn about the role of technology in their very first semester. Their counterparts, across the country, will not undertake study in this area until the twilight of their degree.

The curricular content of these technology subjects vary from degree to degree and differ between universities. At first blush, it is encouraging to discover that there are 60 technology subjects listed within the curriculum of Australian Schools of Education. However, further analysis reveals that there are two types of subjects. The content of one type of subject prepares teachers to teach about technology. Sample titles of these subjects include, science and technology, technology and design, creativity and design, information and technology, and communications and technology.

Of the 60 technology-related subjects included in the analysis, slightly over half (31) are substantially dedicated to instructing students on a subject matter of technology.

The remaining 29 of the 60 technology-related subjects address how to teach with technology. Sample titles include e-learning and futures, teaching with new technologies, multimodal approaches to teaching and learning, ICT across the curriculum and in the classroom, foundations of educational technologies, living and learning with technology, and engaging learners through ICT pedagogy and technology.

Of Australia's 22 Schools of Education discovered through website searches, 13 appear to have offerings that claim to explicitly develop our prospective teachers to teach with technology.

The stated learning outcomes of those subjects designed for this purpose are diverse. Common themes include the engagement of students in educational computing contexts, developing awareness and understanding of digital technologies that support learning in schools, and the sourcing, evaluation and management of digital resources. Considerable focus is given to how staff can support students to extend their ICT skills and articulate how these skills are relevant to teachers' emerging teaching philosophies. The emphasised learning outcome across subjects and universities articulates the importance of technology in living and learning in the 21st century.

The issue of technology training in teacher education is not a matter exclusive to Australia. A wealth of international, scholarly journal articles address the need to explore both what knowledge should be taught to teachers in this field, and how to best prepare teachers to effectively use that knowledge in their classroom practices. There is an increasing body of thought across academic literature that the time for restructuring teacher preparation programs is now. The central messages are that teachers are the essential catalysts of technological advancement and world development, and that they can only actualise this role if they are given more and better education technology training. Whether it is basic computer training for pre-service teachers or fostering a culture where the use of education technology is encouraged, solutions are being pondered and piloted, worldwide, to address the problem of inadequate, teacher education technology training.

A teacher's formal educational journey starts at day one of their pre-service program. Experts are asserting that, from that moment, we should be equipping future teachers with the subject matter and across-curriculum instruction they need to keep up with the affordances of emerging technologies. For those teachers already in the classroom, professional development will ensure they are also prepared to teach in the developing age of technology.

One of the commended solutions is teacher support by means of technologically-proficient learning partners. They could be introduced into the schools to teach the children alongside the classroom teacher, and thus mentor, foster and animate new education technology approaches (For example, www.galileo.org).

More should be done to encourage and inspire creativity and innovation. Funds for research and development should be specifically earmarked for those applications that seek to harness the vast potential of emerging education technologies.

A change is here and growing larger. A bright new age of technology is upon us. Learning is becoming increasingly digital, and the learning outcomes of all students will be forever heightened. Students need their teachers to lead the way. Those at the front of the classroom must be as open to, and as proficient in technology, as those at the back. ETS

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